

# ***Interactive comment on “How Much Cryosphere Model Complexity is Just Right? Exploration Using the Conceptual Cryosphere Hydrology Framework” by Thomas M. Mosier et al.***

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We thank the anonymous reviewers for their thorough reviews. We have made many significant changes to the manuscript in response and believe the analysis is much stronger for it.

We would also like to take this opportunity to reiterate a point made in our manuscript, which is that which model is “superior” depends on a host of factors (e.g. errors in input data, spatial and temporal resolution, evaluation criteria). We therefore do not purport to have identified a model structure that will perform the best under any circumstance. Instead, we believe the principal benefit of this work is the development of a tool for systematically assessing various cryosphere model formulations for the system(s) and

evaluation criteria of interest. Using this framework, we believe that some informative conclusions can be drawn for the models and test cases we evaluate.

Noting this, we agree that strong standards must be upheld in evaluating models, and have strengthened our analysis in three main ways: (1) Evaluating the impact of parameter uncertainty (i.e. equifinality) on results and (2) Comparing the spatial pattern of snow covered area captured by MODIS to model simulations of snow. Additionally, we now use 8-day MODIS images instead of the monthly values used in the original manuscript. (3) Conducting a one watershed validation exercise to complement our primary analysis (i.e. the two watershed approach), in which the same models are calibrated and validated using only Gulkana. In order to address the concerns of the two reviewers, we have undertaken significant additional model development and have rerun all of the model simulations used in the manuscript.

Attached, please find the our point-by-point response to each of the reviewers' comments, including explanations of how we addressed the points in our revised manuscript.

Kind regards, Thomas Mosier (on behalf of David Hill and Kendra Sharp)

Please also note the supplement to this comment:

<http://www.the-cryosphere-discuss.net/tc-2016-17/tc-2016-17-AC1-supplement.pdf>

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